**Asperity-based earthquake likelihood models for Italy**

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The Asperity Likelihood Model (ALM) was first developed for forecasting earthquakes in California (Wiemer and Schorlemmer, SRL, 2007) and is now being tested for performance in the US testing center of the Collaboratory for the Study of Earthquake Predictability (CSEP). The model hypothesizes that small-scale spatial variations in b-value of the Gutenberg and Richter relationship play a central role in forecasting future seismicity. The physical basis of the model is the concept that the local b-value depends inversely on applied shear stress. Thus, low b-values ($b<0.7$) characterize locked patches of faults—asperities—from which future main shocks are more likely to nucleate, whereas high b-vaues ($b>1.1$), found for example in creeping sections of faults, suggest a lower probability of nucleating large events. Here, we calibrate this model for the Italian testing region, the first region in the CSEP European testing center. Italian seismicity is lower, more distributed, and less fault-centric than seismicity in California. Comparison of forecasts of the same model in different regions is a key element in making progress in the study of earthquake forecast models.

We also explore two modified versions of this model: in the ALM.IT model, we in addition decluster the input catalog and smooth the node-wise rates of the declustered catalog with a gaussian filter. Completeness values for each node are determined using the probability-based magnitude of completeness method (Schorlemmer and Woessner, BSSA, 2008). In the HALM (Hybrid Asperity Likelihood Model), a 'hybrid' between a grid-based and a zoning model, the Italian territory is divided into 8 distinct regions depending on the main tectonic regime, and the local b-value variabilily is thus mapped using regional b-values for each tectonic zone.